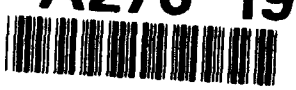

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The view, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentation.

12a. DISTRIBUTION / AVAILABILITY STATEMENT

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12b. DISTRIBUTION CODE

ABSTRACT *(Maximum 200 words)*

This is a final report on a contract whose objective was to provide research support to the Concepts Analysis Agency (CAA) in the solution of large-scale mixed-integer programming models. We assisted in the formulation of a base closing model and provided a solution procedure based on a branch-and-cut algorithm. As a result of this work, we are able to solve relatively small instances of the base closing problem. Further work is needed to provide a customized algorithm that is capable of solving the larger instances in a reasonable amount of time.

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Applications of Mixed-Integer Programming to Selected Military Problems

Final Report

George L. Nemhauser

October 31, 1993

U.S. Army Research Office

Research Agreement No. DAAL03-92-G-0379

Georgia Institute of Technology

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I. Project Statement

The purpose of this contract was to conduct research to support the Concepts Analysis Agency (CAA) in the solution of large-scale mixed-integer programming models.

II. Summary of Results

We provided the CAA with MINTO, a state-of-the-art mixed integer programming code developed by the Computational Optimization Center of the Georgia Institute of Technology.

We then focused on a problem associated with the closing of bases in Germany. The objective of this problem is to minimize the costs associated with closing bases while satisfying distance constraints with respect to the remaining units and the open bases. This is a very difficult problem to solve because of the large number of binary variables and constraints.

Our contributions to the solution of this model were:

1. A reformulation of the model that involved a new treatment of the distance constraints and a disaggregation of the logical constraints.

2. A solution procedure based on a branch-and-cut implementation of MINTO, i.e., at each node of the branch-and-bound tree, the disaggregated constraints are added when they are violated.

As a result of this work, we are able to solve relatively small instances of the base closing problem. Further work is needed to provide a customized algorithm that is capable of solving the larger instances in a reasonable amount of time.

II. Publications

1. G.L. Nemhauser, M.W.P Savelsbergh and G. Sigismondi, "MINTO: a Mixed-Integer Optimizer," to appear in Operations Research Letters, 1993.

2. G.L. Nemhauser, "The Age of Optimization: Solving Large-Scale Real World Problems," to appear in Operations Research, 1994.

III. Scientific Personnel

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IV. Reportable Inventions

None